

**STATE OF NEW HAMPSHIRE
INTRA-DEPARTMENT COMMUNICATION**

FROM: Alex Vadney
Utility Coordinator/Lighting Designer

DATE: February 2, 2010
AT (OFFICE): Department of Transportation
Bureau of Highway Design
Design Services

SUBJECT: Proposed Lighting
Plaistow
10044F

TO: Pete Salo
Consultant Design

THRU: Charles R. Schmidt, P.E.
Chief of Design Services

APPROVAL DATE:

MEMORANDUM

Forwarded herewith, as requested, is/are the proposed lighting design plan(s) and information for your use on the above noted project.

Franchise Power Company: UNITIL

[ALL INFORMATION INDICATED BELOW, IS SHOWN ON THE LIGHTING DESIGN PLAN(S)]

Temporary Lighting

~~_____ Temporary Lighting will be covered under item 670./ 1008.. Estimated cost \$ _____.~~
~~_____ Existing lights will be used during construction.~~
~~_____ Proposed permanent lights will be used during construction.~~
~~_____ Fiberglass poles (with breakaway features) will be required.~~
~~_____ Power Source(s) is/are identified on the plan(s) and location(s) may change due to power availability and approximately (#) _____ Service Poles will be necessary.~~

Permanent Lighting

- 11 Standard Highway Lights to be placed at new pole set locations on:
- 5 New wood distribution pole with aluminum bracket arm salvaged from elsewhere on site
 - 1 Existing wood distribution pole with aluminum bracket arm salvaged from elsewhere on site
 - 4 New Traffic Signal Mast Arm pole with Aluminum Bracket arm salvaged from elsewhere on site
 - 1 Aluminum light pole with aluminum bracket arm salvaged from elsewhere on site
- X A Force Account Agreement with the Power Company will be required for the installation of portions of the permanent lighting design. Programmed cost \$17,000.
- X The following lighting item(s) will be included in the project contract:
- | | |
|---|---|
| <u>_____</u> Item 625.52 Light Pole (Highway) | <u>_____</u> Item 625.522 Reset Light Pole W/out Breakaway Base |
| <u>X</u> Item 625.62 Reset Light Pole (Highway) | <u>X</u> Item 625.22 Conc. Light Pole Base, Type B |
| <u>X</u> Item 614.522 Molded Pull Box | <u>X</u> Item 614.7314 3" PVC Conduit, SCH 40 |
| <u>X</u> Item 614.7318 3" PVC Conduit, SCH 80 | |
- X Lighting Facility responsibilities:
- Ownership & Maintenance UNITIL.
 - Cost of Operation District 6.
 - Conduit & Pull Boxes NHDOT.

Design Services requests that the checked off information be incorporated into the contract plans and estimate. Once completed, please provide two (2) copies to us for review/approval. When approval is granted these plans will be sent to the Power Company and an estimate will be requested for their portion of the lighting work.

Attachments

cc: Project Manager, Utilities, District 5

STATE OF NEW HAMPSHIRE
INTRA-DEPARTMENT COMMUNICATION

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Utility Coordinator/Lighting Designer

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_____ Power Source(s) is/are identified on the plan(s) and location(s) may change due to power availability and approximately (#) _____ Service Poles will be necessary.

Permanent Lighting

_____ Standard Highway Lights to be placed at new pole set locations on:
_____ Aluminum pole having breakaway features
_____ New Wood distribution pole with Aluminum Bracket arm
_____ A Force Account Agreement with the Power Company will be required for the installation of portions of the permanent lighting design. Programmed cost \$ _____
_____ The following lighting item(s) will be included in the project contract:
_____ Item 625.52 Light Pole Highway
_____ Item 625.22 Conc. Light Pole Base, Type B
_____ Item 614.522 Molded Pull Box
_____ Item 614.7314 3" PVC Conduit, SCH 40
_____ Lighting Facility responsibilities:
- Ownership & Maintenance _____
- Cost of Operation _____
- Conduit & Pull Boxes _____

Design Services requests that the checked off information be incorporated into the contract plans and estimate. Once completed, please provide two (2) copies to us for review/approval. When approval is granted these plans will be sent to the Power Company and an estimate will be requested for their portion of the lighting work.

Attachments

cc: Project Manager, Utilities, District

Document2

December 2010

**HIGHWAY DESIGN
CALCULATION SHEET**

SUBJECT PERMANENT LIGHTING DESIGN

PROJECT
PROJECT NO.
CALCULATED BY
CHECKED BY

Plaistow

10044-F

APV

ROUTE **NH-125**

DATE **1/29/2010**

DATE

SHEET **1** OF **2**

From		TO	
NH RT 125			
STATION	OFFSET	STATION	OFFSET
1269+50	30' LT	1273+50	48' RT *
1286+13	45' RT	1276+55	48' RT * ²
1289+25	55' RT	1277+66	55' LT * ²
609+95	25' RT	1282+00	45' RT *
		1284+78	55' RT *
1292+40	52' RT	1291+05	60' RT * ²
		1293+10	60' LT * ²
			48' RT *
		1307+93	44' LT *
1294+35	25' LT	1316+95	53' RT * ³
NH 121A		NH 121A	
608+95	25' LT	610+50	45' LT *

= INSTALL 250 WATT HPS FULL CUTOFF LUMINAIRE ON NEW WOOD DISTRIBUTION POLE WITH ALUMINUM BRACKET ARM SALVAGED FROM ELSEWHERE ON THE PROJECT

*1 = INSTALL 250 WATT HPS FULL CUTOFF LUMINAIRE ON EXISTING WOOD DISTRIBUTION POLL WITH BRACKET ARM SALVAGED FROM ELSEWHERE ON THE PROJECT

*2 = INSTALL 250 WATT HPS FULL CUTOFF LUMINAIRE WITH 12' BRACKET ARM @ 40' MOUNTING HEIGHT ON NEW TRAFFIC SIGNAL MAST ARM.

= INSTALL 250 WATT HPS FULL CUTOFF LUMINAIRE ON EXISTING ALUMINUM LIGHT POLE SALVAGED FROM ELSEWHERE ON THE PROJECT, BUT DO INSTALL A BREAKAWAY BASE.



**HIGHWAY DESIGN
CALCULATION SHEET**

SUBJECT PERMANENT LIGHTING DESIGN

PROJECT
PROJECT NO.
CALCULATED BY
CHECKED BY

PLAISTOW

10044-F

APV

ROUTE **NH-125**

DATE **1/29/2010**

DATE

SHEET **2** OF **2**

PSNH FORCE ACCOUNT LIGHTING ESTIMATE

MATERIALS	UNIT PRICE	QUANTITY	TOTAL COST
250 WATT HPS FULL CUTOFF	\$107.43 EA	11 EA	\$1,181.73
250 WATT LAMP	\$13.79 EA	11 EA	\$151.69
PHOTO CELL	\$8.69 EA	11 EA	\$95.59
1/0 3 W UG CABLE	\$0.99 LF	835 LF	\$826.65
14/2 COPPER ST. LIGHT WIRE	\$0.43 LF	250 LF	\$107.50
FUSE HOLDER	\$53.49 EA	5 EA	\$267.45
LIGHTNING ARRESTER	\$36.29 EA	5 EA	\$181.45
FUSE	\$2.65 EA	5 EA	\$13.25
4 POSITION MOLE	\$25.37 EA	16 EA	\$405.92
20 FT. 3" PVC CONDUIT RISER	\$19.46 EA	3 EA	\$58.38
CONN SIBUS INS 600V	\$15.47 EA	16 EA	\$247.52
TOTAL MATERIAL =			\$3,537.13

PSNH LABOR AND EQUIPMENT ESTIMATE

USING A PULL RATE OF 200LF/HR OF CABLE

$$\text{TOTAL CABLE} = \frac{1085 \text{ LF}}{200 \text{ LF/HR}} = \underline{\underline{5 \text{ HRS.}}}$$

ASSUMING 1.5 HRS OF WORK INVOLVED
AT EACH PULLBOX AND LIGHT LOCATION
FOR SPLICING AND INSTALLING

$$13 \text{ LOCATIONS} \times 1.5 \text{ HRS} = \underline{\underline{20 \text{ HRS.}}}$$

LABOR HOURS = # HRS.

ASSUME 5 WORKING HRS/DAY OUT OF AN 8 HOUR DAY

$$\frac{24.9 \text{ HRS}}{5 \text{ HRS/DAY}} = \underline{\underline{5 \text{ DAYS}}}$$

THE REMAINING 3 HOURS OF THE 8 HOUR WORK
DAY IS RESERVED FOR TRAVEL TIME AND
TRAFFIC CONTROL STEP UP/TAKE DOWN

$$\frac{4.99 \text{ DAYS}}{\times 3 \text{ HRS/DAY}} = \underline{\underline{15 \text{ HRS}}}$$

$$\text{TOTAL WORK HOURS} = \text{HOURS OF WORK} + \text{HOURS OF TRAVEL} = \underline{\underline{40 \text{ HRS}}}$$

1 FOREMAN, 1 LINEWORKER AND 1 HEAVY DUTY BUCKET TRUCK AT \$335.14/HOUR

$$\$335.14 \text{ /HR} \times 39.9 \text{ HRS} = \underline{\underline{\$13,365.38}}$$

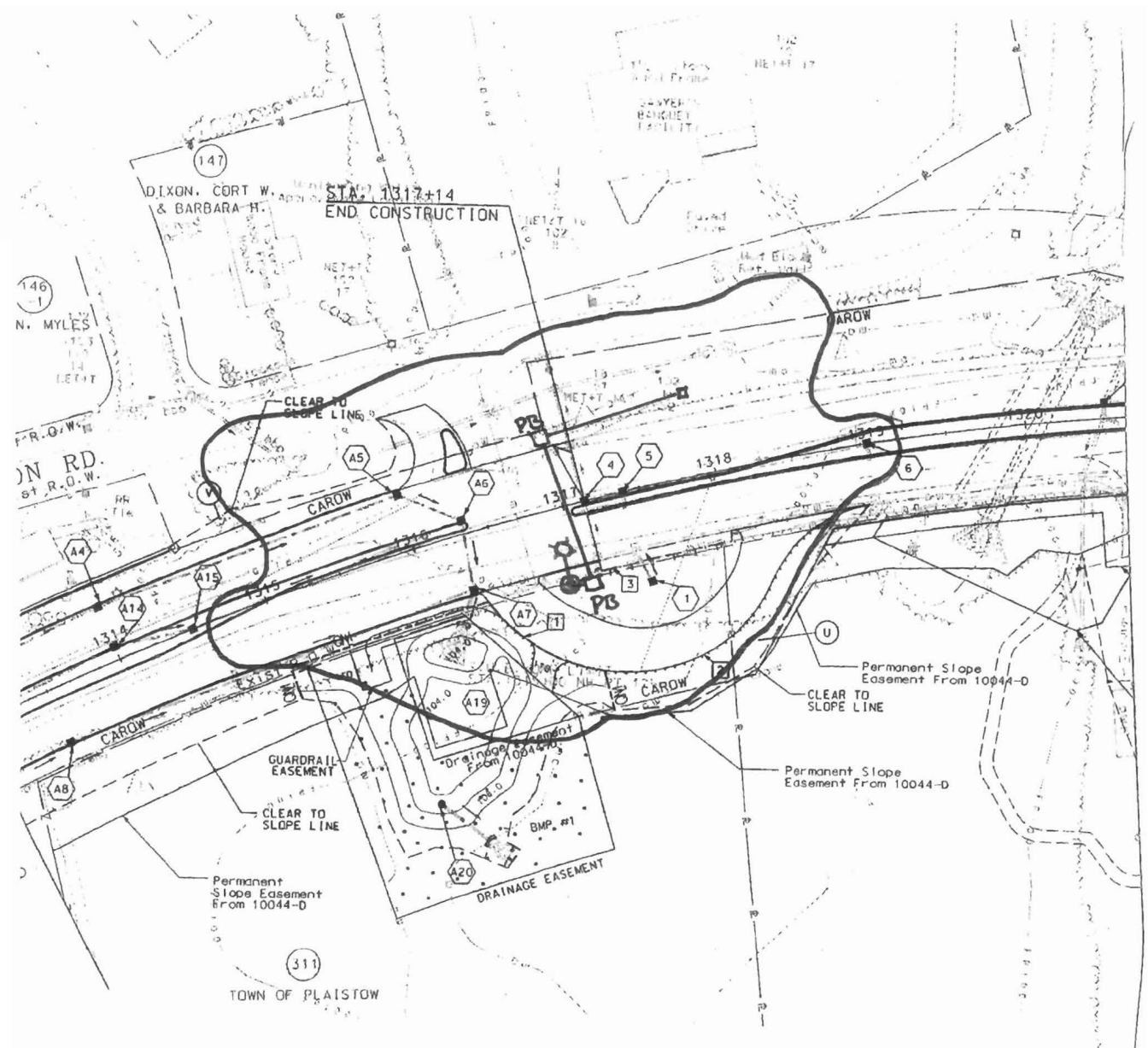
$$\text{TOTAL LIGHTING ESTIMATE FOR UNIT} = \underline{\underline{\$16,902.51}}$$

Appendix

Luminaire Distribution Pattern

Plaistow 10044F NH 125- Example:

250W HPS Full Cutoff, Type III

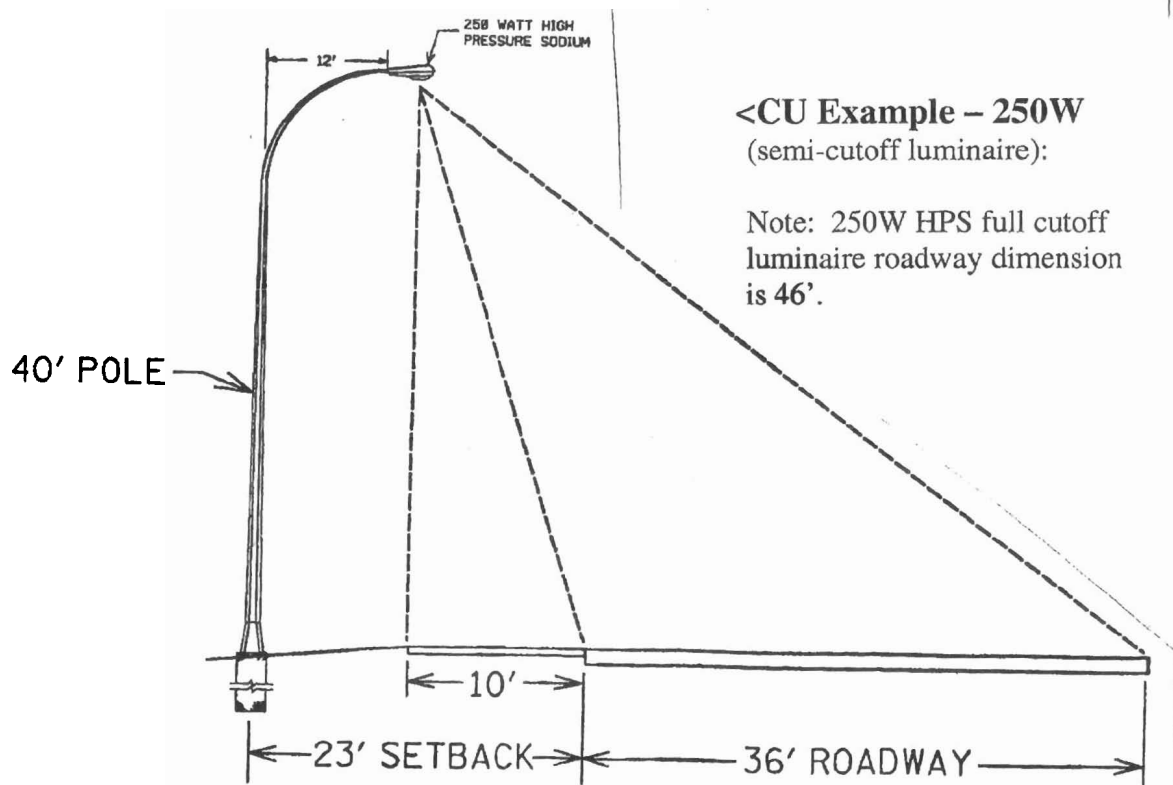
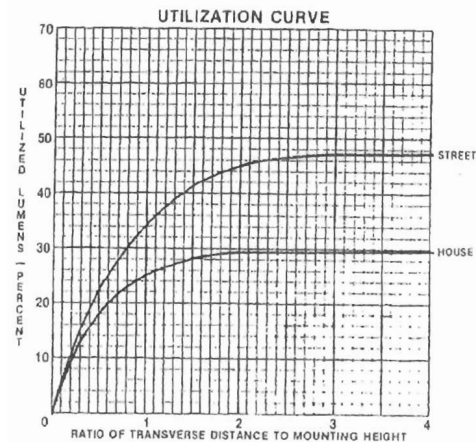


Appendix

Coefficient of Utilization Curve (CU):

Two curves are shown in the graphic, one for the street side (normally the desired area to be lit) and one for the house side (the direction away from the primary lit direction). The street curve represents the utilization of the bare lamp, in percent, as the ratio of transverse distance to mounting height increases.

The utilization curve shown represents a 250W HPS full cutoff luminaire >



Appendix

Isofootcandle Chart:

An isofootcandle chart is used to describe the light pattern a luminaire produces. These charts show exact plots or lines of equal footcandle levels on the work plane with the fixture at a designated mounting height.

An isofootcandle curve for a typical full cut-off cobra head 250W HPS luminaire is shown below.

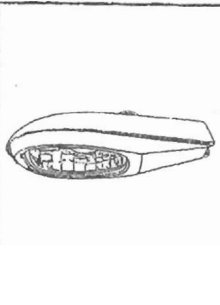
General Electric M-250R2 Luminaire
With Cutoff Optics, Reflector No. 35-232433-03
Refractor Clear Flat Glass, Socket Position 1
LAMP—200 TO 250 WATT HIGH PRESSURE SODIUM

ANSI TYPE ... CUTOFF MEDIUM TYPE III
MOUNTING HEIGHT ... 30 FT.
MAX CANDELA ... 416.3
MAX CONE ... 72.5°
MAX VERTICAL PLANE ... 62.5°/297.5°
MAX CANDELA AT 90° ... 0.0
MAX CANDELA AT 80° ... 8.5
NADIR FOOTCANDLES ... 0.2792
NADIR CANDELA ... 251.3

MULTIPLY ALL LUMEN, CANDELA AND FOOTCANDLE VALUES BY THIS RATIO, RATIO = ACTUAL LAMP LUMENS ÷ 1000

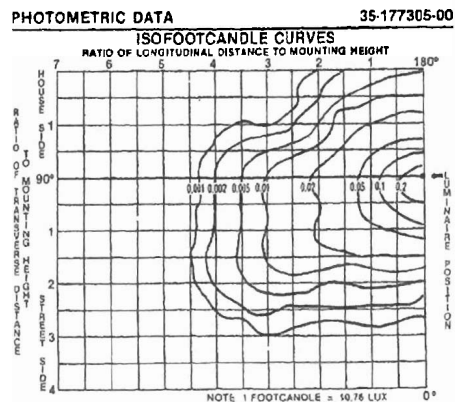
LIGHT FLUX VALUES		
	LUMENS	% OF LAMP
DOWNWARD STREET SIDE	467	46.7
UPWARD STREET SIDE	0	0.0
DOWNWARD HOUSE SIDE	291	29.1
UPWARD HOUSE SIDE	0	0.0
TOTAL	758	75.8

PER 1000 LAMP LUMENS



<250W HPS Full cut-off Luminaire Specifications

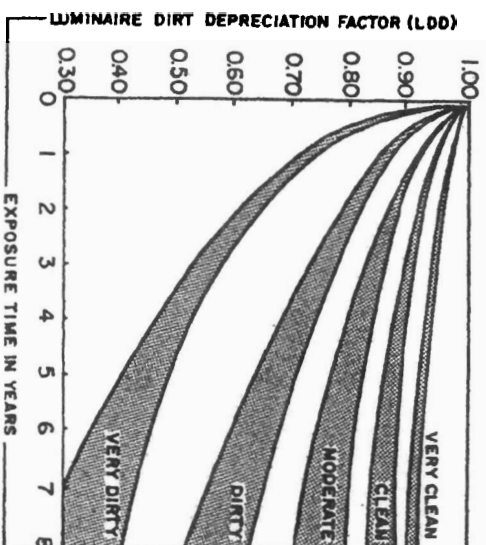
Photometric Data – Isofootcandle Curves>



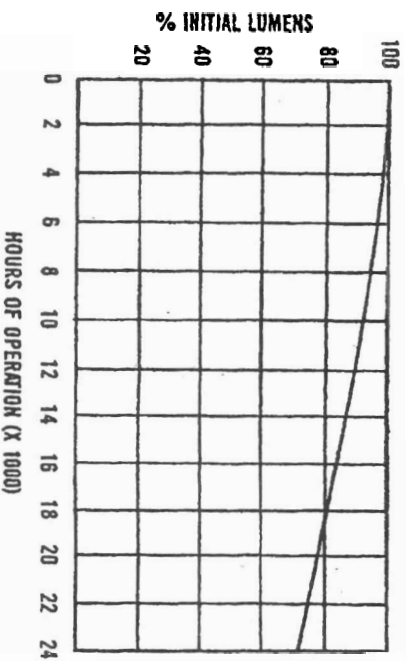
Appendix

In determining the light output for a luminaire, the lighting system designer must consider the luminaire light loss factor. The luminaire light loss factor is a combination of several factors, including the Lamp Lumen Depreciation Factor (LLD) and the Lamp Dirt Depreciation Factor (LDD). For further information on the LDD and LLD factors see page 79. See nomographs listed below:

LDD Factor Nomographs>



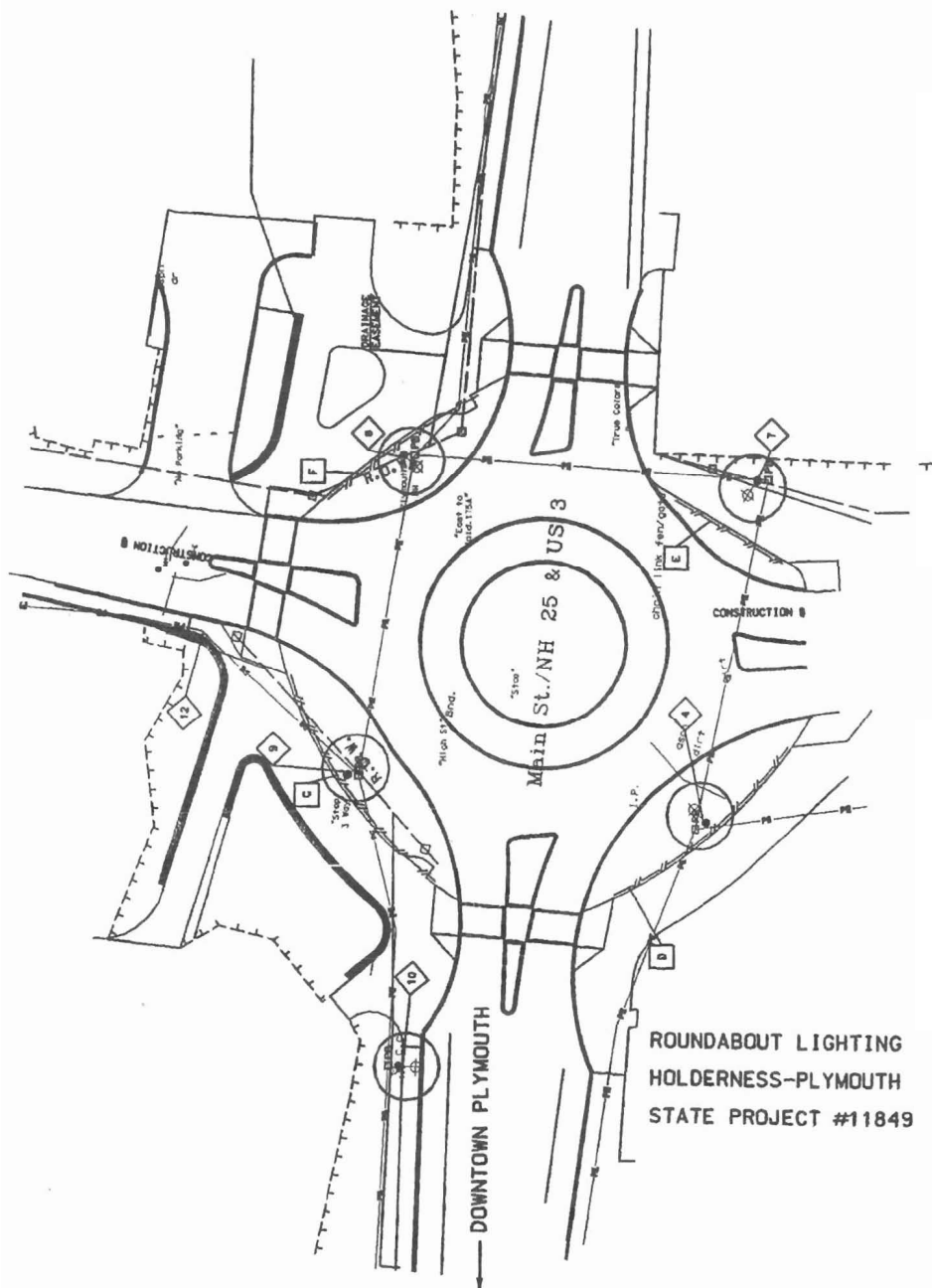
LUMEN MAINTENANCE

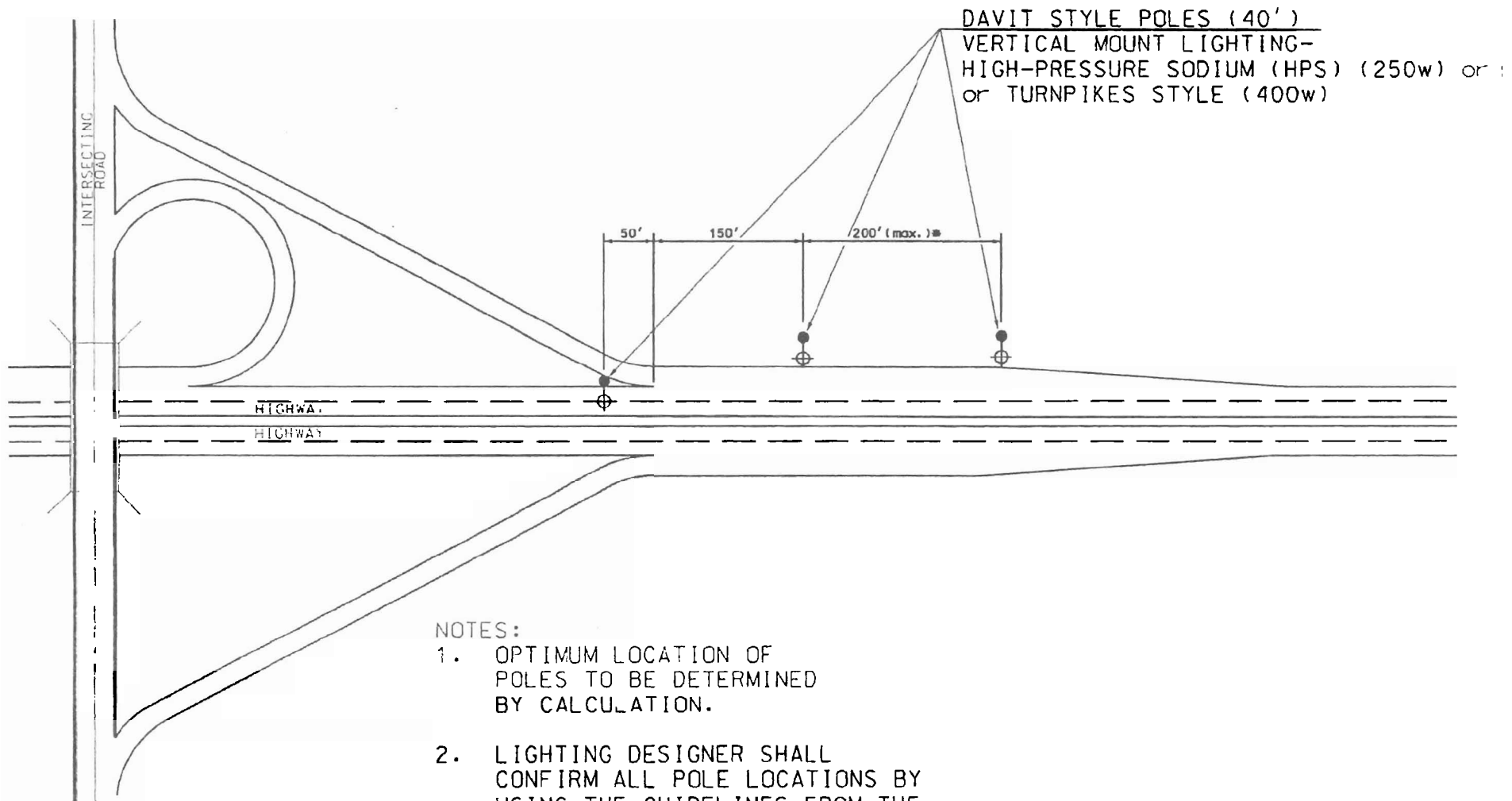


<LLD Factor Nomographs

Appendix

Example locations for poles at a roundabout are shown below (circled), for the Holderness-Plymouth project #11849. It should be noted that this plan is a sample layout only. Each project must be evaluated on a case by case basis utilizing referenced guidelines of AASHTO and FHWA and any unique characteristics of the project.





NOTES:

1. OPTIMUM LOCATION OF POLES TO BE DETERMINED BY CALCULATION.
2. LIGHTING DESIGNER SHALL CONFIRM ALL POLE LOCATIONS BY USING THE GUIDELINES FROM THE AASHTO ROADWAY LIGHTING GUIDE.
- *3. TYPICAL LUMINAIRE SPACING BASED ON A 4:1 UNIFORMITY RATIO AND AN AVERAGE 0.8 FOOTCANDLES ILLUMINATION.

FIGURE: T-1

New Hampshire

DOT

Department of Transportation

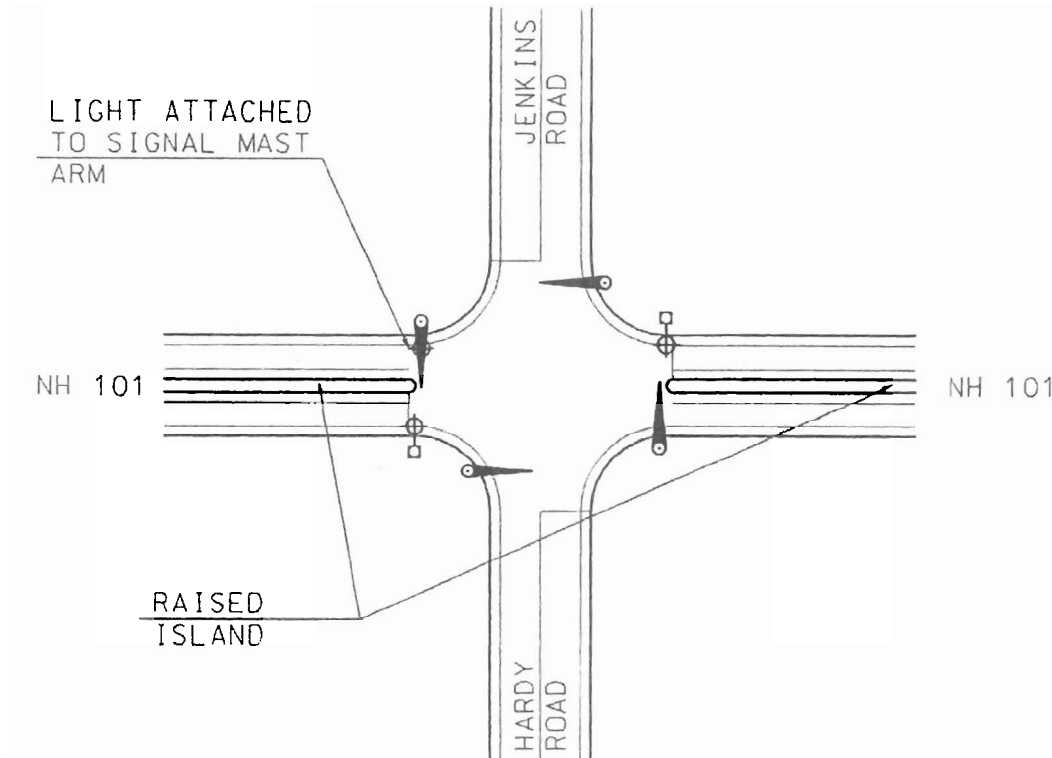
Lighting
Design
Manual

PARTIAL INTERCHANGE
LIGHTING - FOUR LANE
DIVIDED HIGHWAY

scale = NTS

AUGUST 2010

DAVIT STYLE POLES (40')
 12' MAST ARMS
 HIGH-PRESSURE SODIUM (HPS)-250W

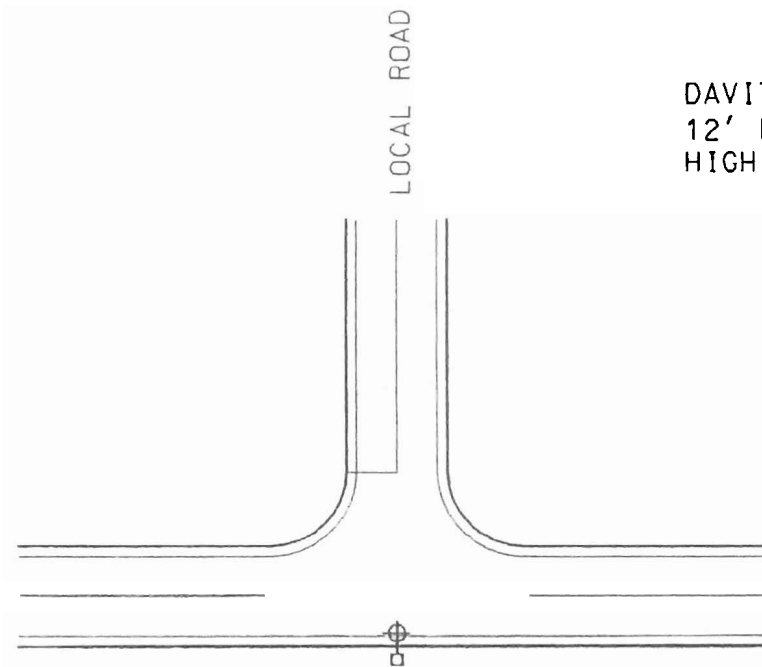


NOTE: EACH INTERSECTION MUST BE
 EVALUATED BASED ON TRAFFIC
 COUNTS, MAST ARM LOCATION AND
 OTHER FACTORS TO DETERMINE THE
 NEED FOR ADDITIONAL LIGHTING.

LOCATION: BEDFORD, NH
 RTE 101-HARDY ROAD & JENKINS ROAD
 FIGURE: T-2

New Hampshire
DOT
 Department of Transportation
**Lighting
 Design
 Manual**

4-WAY
 SIGNALIZED
 INTERSECTION
 scale = NTS



DAVIT STYLE POLES (40')
 12' MAST ARMS
 HIGH PRESSURE SODIUM (HPS)-(150W-250W)

STATE HIGHWAY

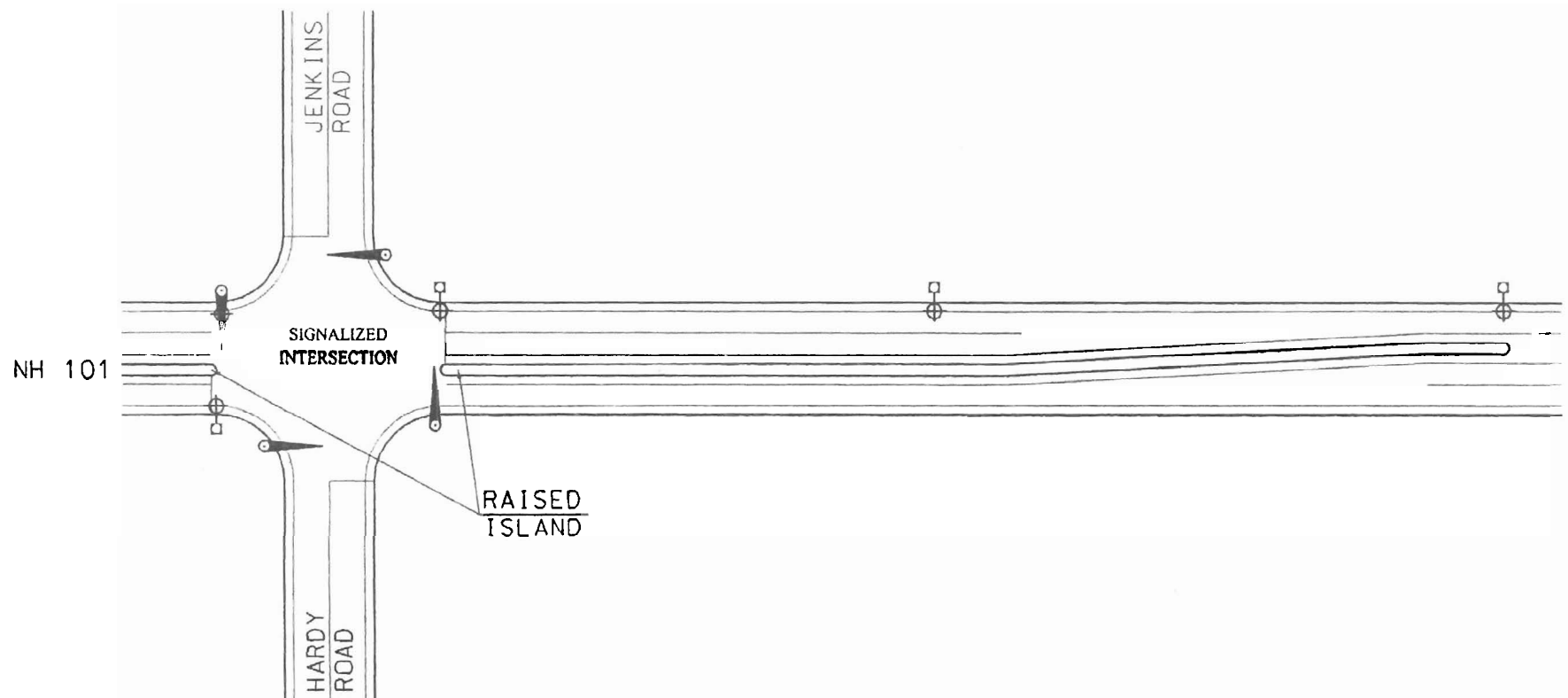
FIGURE: T-3

New Hampshire
DOT
 Department of Transportation
**Lighting
 Design
 Manual**

RURAL
 3-WAY
 INTERSECTION

scale = NTS

DAVIT STYLE POLES (40')
12' MAST ARMS
HIGH-PRESSURE SODIUM (HPS)-250W



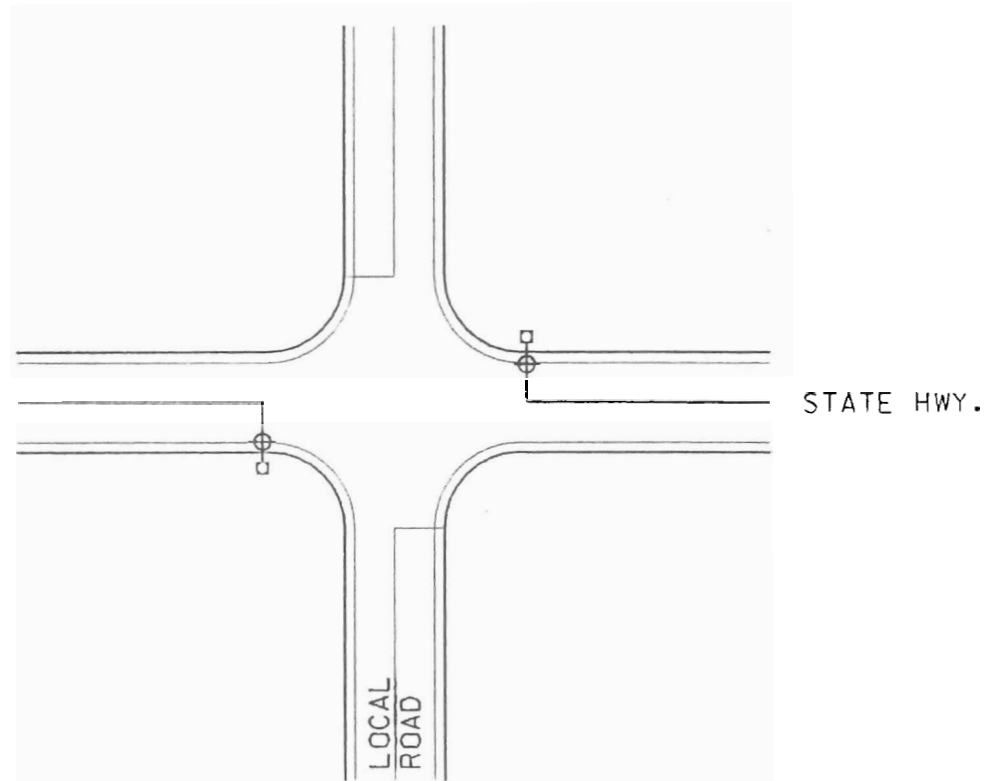
LOCATION: BEDFORD, NH
FIGURE: T-4

New Hampshire
DOT
Department of Transportation
**Lighting
Design
Manual**

RAISED ISLAND &
CHANNELIZED LANE
CONFIGURATION ENTERING
A SIGNALIZED INTERSECTION

scale = NTS

DAVIT STYLE POLES (40')
 12' MAST ARMS
 HIGH-PRESSURE SODIUM (HPS)-250W



NOTE: EACH INTERSECTION MUST BE
 EVALUATED BASED ON TRAFFIC
 COUNTS, AND OTHER FACTORS TO
 DETERMINE THE NEED FOR
 ADDITIONAL LIGHTING.

FIGURE: T-5

New Hampshire
DOT
 Department of Transportation

**Lighting
 Design
 Manual**

4-WAY
 INTERSECTION
 (no signals)

scale = NTS

HIGHWAY DISTRICTS



NHDOT – Concord Contact Information

Highway Lighting and related questions

Chief of Design Services
603-271-2297

DISTRICT ENGINEERS

1. 641 Main St.
Lancaster, NH 03584
Tel: 788-4641

2. Exit 16, I-89 Enfield
8 Eastman Hill Rd
Enfield NH 03748
Tel: 448-2654

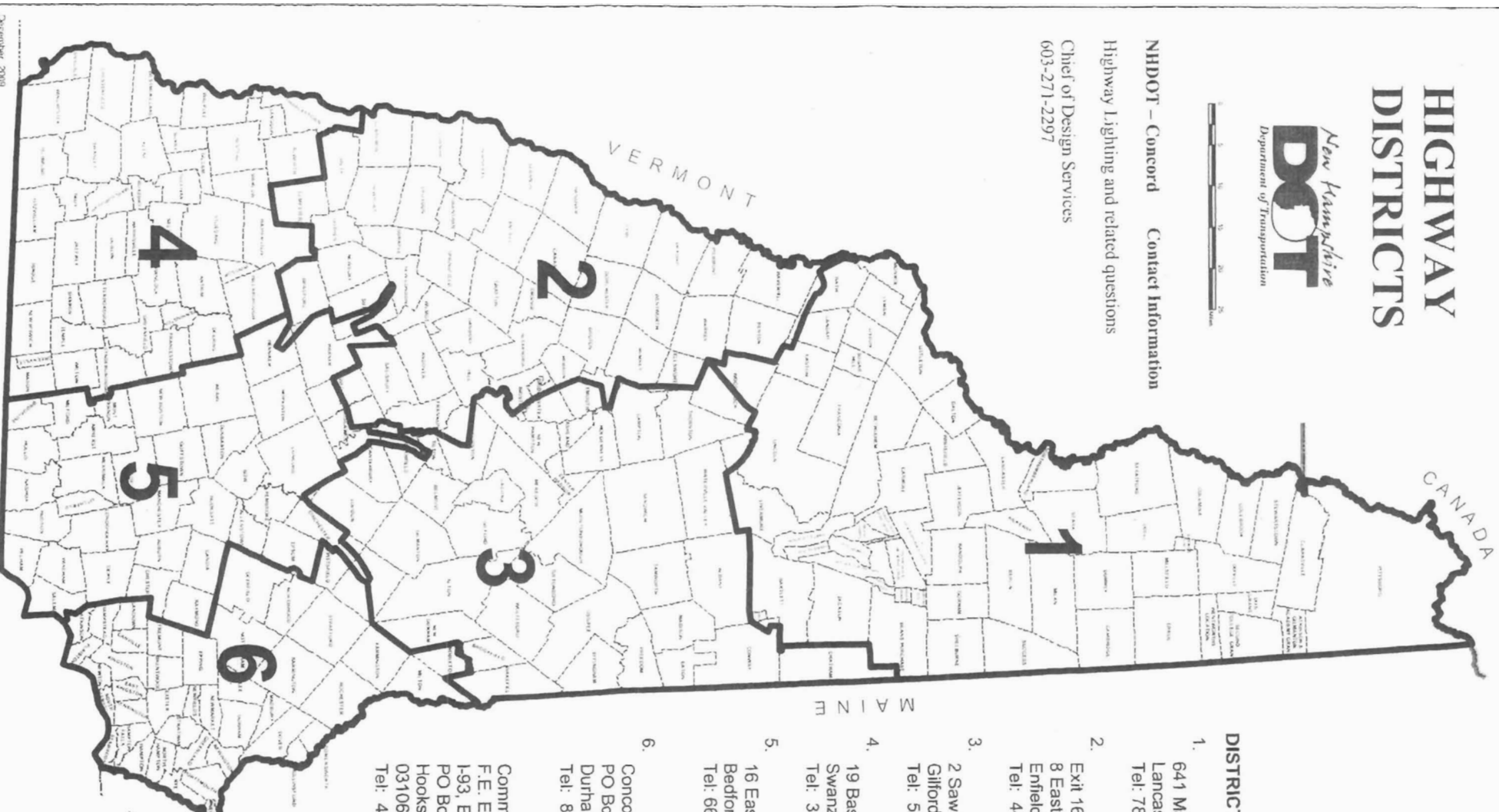
3. 2 Sawmill Rd
Gilford, NH 03246
Tel: 524-6667

4. 19 Base Hill Rd
Swanzey, NH 03446
Tel: 352-2302

5. 16 East Point Dr
Bedford, NH 03110
Tel: 666-3336

6. Concord Rd, Rt 155A
PO Box 740
Durham, NH 03824
Tel: 868-1133

Communications Section
F.E. Everett Turnpike
I-93, Exit 11
PO Box 16476
Hooksett, NH
03106-6476
Tel: 485-3806



8. List of References/Acknowledgements

A Policy on Geometric Design of Highways and Streets, American Association of State Highway and Transportation Officials, Washington, DC, 2001.

Roadway Lighting Design Guide, American Association of State Highway and Transportation Officials, Washington, DC, 2005.

Manual of Uniform Traffic Control Devices, Federal Highway Administration, Washington, DC, 2007.

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Lighting Design Guide, Colorado Department of Transportation – CDOT, February 2006.

Indiana Manual on Traffic Control Devices, Indiana Department of Transportation – IDOT, 2008

Specifier Bulletin for Dark Sky Applications – Volume 2: Issue 1, International Dark Sky Association, Tucson, AZ, 2009

Roadway Lighting RP-8, Illuminating Engineering Society of North America – IESNA, New York, NY, 2000

Holophane Product Catalogue, September 2001

Highway Design Manual, New Hampshire Department of Transportation, 2007